Struggling for Context: An Appraisal of "Struggling for Air"

by Craig N. Oren

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Richard Revesz's and Jack Lienke's new book, *Struggling for Air*,[1] has attracted considerable attention: for instance, it was the subject of a symposium in this publication.[2] I want to build on that discussion here, taking a different perspective from any expressed in the symposium.

Revesz and Lienke argue that there was a tragic flaw in the Clean Air Act (CAA) Amendments of 1970[3]: the "grandfathering" of existing electricity generating units by exempting them from national emissions standards. This, they argue, encouraged pre-1970 units to continue to run without sufficient pollution controls and to injure health and the environment.

The book is incisive and a good read; everyone concerned with environmental issues should study it. But I want to question the authors' account of why "grandfathering" came to be, as well as their assumption that trying to regulate power plants as they wished would have proven effective.

The authors begin by providing an excellent primer on how coal is used and its health and welfare effects.[4] As the authors point out, coal contains sulfur—coal mined in the eastern United States has a particularly high sulfur content[5]—and when burned, the sulfur becomes sulfur dioxide, a dangerous air pollutant.[6] Even worse, the sulfur dioxide, along with the nitrogen oxide produced by high-temperature combustion, wafts downwind generally from the many power plants in the Midwest or Southeast to the Northeast and eastern Canada, and is converted into fine particles. This particulate matter causes acid rain and impairs visibility.[7] The particles are so small that they can penetrate into the deep lung, and studies have shown a strong correlation between concentrations of particulate matter in the air and the daily mortality rate in the locale.

In addition, coal contains trace amounts of mercury that, when the coal is burned, is transformed into a soluble compound that bioaccumulates in fish, and causes neurological impairments in those who eat it—generally, the rural poor who depend on subsistence fishing for part of their dietary needs. Fetuses are particularly subject to damage.[8] Finally, as the authors point out, coal-burning utilities contribute close to 30% of greenhouse gases that are warming the earth and threatening disruption of the ecosystem as well as damage to public health.

As Revesz and Lienke note, concern about the effects of coal-fired power plants and efforts to control those effects go back at least 25 years, rather than being a "War on Coal" launched by the Barack Obama Administration.[9] Indeed, concern about long-range transport of pollution from coal-fired plants goes back to the U.S. Environmental Protection Agency's (EPA's) struggles in the early 1970s against

Author's Note: The author thanks all of those who helped him, but the responsibility for the contents belongs to the author alone.

1. Richard L. Revesz & Jack Lienke, Struggling for Air: Power Plants and the "War on Coal" (2016) [hereinafter Struggling].
2. William M. Bumpers et al., *Grandfathering Coal: Power Plant Regulation Under the Clean Air Act*, 46 ELR 10541 (July 2016). And just before this Comment went to press, Leon Billings and Thomas Jorling, the leading staffers who assisted in drafting the Clean Air Act Amendments of 1970, released an open letter to Revesz and Lienke criticizing their book. Clean Air Watch, *Guest Post: Setting the Record Straight on the Clean Air Act* (Sept. 9, 2016), http://www.cleanairwatch.org/2016/09/guest-post-setting-record-straight-on.html.
3. Pub. L. No. 91-604, 84 Stat. 1709.
4. *See* Struggling, *supra* note 1, at 7-12.
5. *Id*. at 11.
6. For the U.S. Environmental Protection Agency's (EPA's) most recent standards and an explanation of the health and welfare effects of the pollutant, see National Ambient Air Quality Standards for Sulfur Dioxide, 75 Fed. Reg. 35520 (June 22, 2010); EPA's most recent attempt to update its assessment of sulfur dioxide may be found at *Integrated Science Assessment for Sulfur Oxides—Health Criteria (External Review Draft)*, *available at* https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310044.
7. For EPA's most recent ambient air quality standards for particulate matter, including a description of its effects, see National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086 (Jan. 15, 2013). EPA's most recent update of its assessment of particulate matter may be found at U.S. Environmental Protection Agency, Draft Integrated Review Plan for the National Ambient Air Quality Standards for Particulate Matter (2016), *available at* https://yosemite.epa.gov/sab/sabproduct.nsf//LookupWebProjectsCurrentCASAC/EB862B233FBD0CDE85257DDA004FCB8C/$File/Draft+Integrated+Review+Plan+for+the+PM+NAAQS_CASAC+Review+Draft.pdf.
8. For EPA's most recent national emission standards for existing power plants, see National Emission Standards for Hazardous Air Pollutants From Coal- and Oil-Fired Electric Utility Steam Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional and Small Industrial-Commercial-Institutional Steam-Generating Units, 77 Fed. Reg. 9304 (Feb. 16, 2012).
9. Struggling, *supra* note 1, at 22-23.

states and federal agencies that wanted to allow power plants to rely on tall stacks and other dispersion techniques rather than limit the plants' emissions.[10]

It is thus vitally important that air pollution emissions from coal-fired power plants be controlled. Emissions from new plants have been limited by the CAA's new source performance standards, which require that new plants include scrubbers to reduce sulfur dioxide and selective catalytic reduction to lower nitrogen oxide emissions.[11] The acid rain provisions of the 1990 Amendments[12] caused some existing plants to install scrubbers, and others to switch to burning low-sulfur coal.[13] EPA's regulations in the 1990s and 2000s to decrease interstate air pollution, while slow in coming, have also controlled existing plants in the Midwest.[14] And EPA's standards for emissions from power plants of hazardous air pollutants like mercury have brought about billions of dollars in investment in controls at power plants and a halving of mercury emissions between 2004 and 2014.[15] Most recently, EPA has promulgated its Clean Power Plan, which seeks to speed the transition of utilities from coal to natural gas and renewable sources such as wind and solar.[16] These rules are one reason why some old coal-fired power plants are closing down, and why more can be expected to close, assuming the Clean Power Plan goes into effect.[17]

All of this regulation, though, has taken nearly a half century to establish, and the programs EPA has instituted have been dragged down by the need to accommodate power plants built before enactment of the 1970 Amendments. These plants have stayed on line much longer than expected, due at least in part to the requirement that new plants install scrubbers and other control equipment, and in part to EPA's failures in implementing provisions of the CAA that were available for controlling existing plants. Thus, Revesz and Lienke urge that the CAA Amendments of 1970, which established the basics of today's CAA, contained a "tragic flaw"—the amendments did not require existing power plants to do all they could to control air pollution.[18]

In Chapter 3, Revesz and Lienke trace the flaw to the actions of Sen. Edmund Muskie (D-Me.), sometimes called the father of the CAA.[19] Senator Muskie chaired the Subcommittee on Air and Water Pollution of the U.S. Senate Committee on Public Works, the subcommittee with legislative jurisdiction over the CAA. In the authors' view, Senator Muskie and the U.S. Congress missed the mark by not requiring that existing power plants meet national emission standards.

Revesz and Lienke attribute Senator Muskie's actions to "hamartia"—a mistake born of ignorance, rather than one of moral fault.[20] But we should hesitate before condemning Senator Muskie for this error: ignorance—failure to know the truth—is not culpable unless the actor disregards available data or negligently fails to inform herself.[21] Ignorance is endemic to environmental law, where decisions are almost always made under conditions of uncertainty because of gaps in our knowledge about science and about

10. *See* R. Shep Melnick, Regulation and the Courts: The Case of the Clean Air Act 113-54 (1983).
11. EPA's most recent new source performance standards for these pollutants can be found at 40 C.F.R. §§60.40Da et seq. (2015); the Agency's rationale may be found at 71 Fed. Reg. 9866 (Feb. 27, 2006).
12. Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2584 (adding new Title IV to the Clean Air Act, codified at 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618).
13. A. Denny Ellerman et al., Markets for Clean Air: The U.S. Acid Rain Program 126-27 (2000).
14. EPA's initial regulations can be found at Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Region for Purposes of Reducing Regional Transport of Ozone, 63 Fed. Reg. 57356 (Oct. 27, 1998). EPA revised and expanded these regulations in 2005 in what became known as the CAIR program. Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule), 70 Fed. Reg. 25162 (May 12, 2005). Following judicial remand of the latter regulations, EPA established the Cross-State Air Pollution Rule. Federal Implementation Plans: Interstate Transport of Fine Particulates and Ozone and Correction of SIP Approvals, 76 Fed. Reg. 48208 (Aug. 8, 2011). Initial judicial disapproval of this program, *EME Homer City Generation v. EPA*, 696 F.3d 7, 42 ELR 20177 (D.C. Cir. 2012), was reversed by the U.S. Supreme Court in *EPA v. EME Homer City Generation*, 134 S. Ct. 1584, 44 ELR 20094 (2014). EPA has just promulgated a rule that goes further. Patrick Ambrosio, *More Power Sector Emissions Cuts Required by EPA,* 47 Env't Rep. (BNA) Current Dev. 2585 (2016).
15. *See* Patrick Ambrosio, *Murray Energy Plans Array of Challenges to EPA Mercury Rule*, 46 Env't Rep. (BNA) Current Dev. 2245 (2016); *Mercury From Coal Plants Down, But Gains Uneven*, 46 Env't Rep. (BNA) Current Dev. 3655 (2015). The D.C. Circuit's decision upholding the regulations, *White Stallion Energy Center v. EPA,* 748 F.3d 1222, 44 ELR 20088 (D.C. Cir. 2014), was reversed in part by the Supreme Court in *Michigan v. EPA*, 135 S. Ct. 2699, 45 ELR 20124 (2015), which ruled that EPA had erred by not considering cost in making the decision to regulate emissions from power plants of mercury and other air toxics. The rules, though, remain in effect pending the D.C. Circuit's decision on EPA's supplemental finding that considers cost and finds the rules justifiable nonetheless. *See* Patrick Ambrosio, *EPA Reaffirms Finding on Power Plant Mercury Rule*, 47 Env't Rep. (BNA) Current Dev. 1215 (2016).
16. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 81 Fed. Reg. 64662. The Supreme Court stayed these rules earlier this year. Andrew Childers, *Clean Power Plan Stay Halts Some State Planning*, 47 Env't Rep. (BNA) 448 (2016). *See* Craig N. Oren, *What Will Come From the Supreme Court's Stay of EPA's Clean Power Plan?*, RegBlog (Feb. 22, 2016), *available at* http://www.regblog.org/2016/02/22/oren-clean-power-plan-stay/ (commentary from author on the stay).
17. *See* Struggling, *supra* note 1, at 154; 47 Env't Rep. 2385 (2016); Coral Davenport, *As Wind Power Lifts Wyoming's Fortunes, Coal Miners Are Left in the Dust*, N.Y Times (June 19, 2016), *at* http://www.nytimes.com/2016/06/20/us/as-wind-power-lifts-wyomings-fortunes-coal-miners-are-left-in-the-dust.html.
18. Struggling, *supra* note 1, at 3.
19. *See* Arthur J. Higgins, *Maine Groups Join Forces to Fight Attacks on Clean Air Act*, Natural Resources Council of Maine (June 21, 2011), *available at* http://www.nrcm.org/news/environmental-issues-in-the-news/maine-groups-join-forces-to-fight-attacks-on-clean-air-act/.
20. Struggling, *supra* note 1, at 53 According to them, citing Aristotle, the tragic flaw in Oedipus was that he did not know the identity of his father rather than the flaw being Oedipus' hot temper. But rather both flaws are at work: otherwise the tragedy—the killing by Oedipus of his father—would not have occurred. Therefore, I suggest with caution that Aristotle's formulation may be as incorrect as his physical science.
21. Oxford Dictionaries, *at* http://www.oxforddictionaries.com/us/definition/american_english/ignorant (defining "ignorant" as "lacking knowledge or awareness in general; uneducated or unsophisticated").

the future generally.[22] Indeed, uncertainty is endemic to the human condition; none of us know the future. And often, even if we believe we know what will happen, we lack the power to take steps to respond properly.

Thus, to be valid, Revesz and Lienke's criticism would require, first, that Senator Muskie knew or should have known that emissions from coal-fired power plants cause acid rain, for instance and that acid rain would become a serious environmental problem; and finally, that he had the power to prevent such a problem by mandating the control of existing power plants. But none of these prerequisites are met.

Legislative History of the CAA

As Revesz and Lienke note, the story begins in 1967, when Congress passed the Air Quality Act.[23] The Lyndon Johnson Administration proposed that the federal government set and enforce national standards regulating the emissions of new and existing stationary sources (factories and power plants).[24] At that time, standard-setting for these sources was exclusively a state or local function.

The Johnson Administration proposal met with opposition from the subcommittee and especially from Senator Muskie.[25] The latter pointed out that the severity of air pollution problems varies from area to area. Nationally uniform emissions standards for stationary sources would in many cases not be sufficient to assure that areas would achieve healthful air.[26] Moreover, technology-based standards would give industries little incentive to develop better controls that would protect people and the environment from air pollution. And Senator Muskie made clear that he believed the foundation of air pollution control should be the protection of public health.[27]

Thus, the Air Quality Act of 1967 did not contain national emission standards for existing sources. Instead, it enacted a different approach that had been part of the bill recommended by the Johnson Administration: the Act mandated the Secretary of Health, Education & Welfare (the department that included the National Air Pollution Control Agency (NAPCA), the predecessor in air pollution control to today's EPA) to develop "criteria" that would describe the effects of a particular air pollutant on health and the environment. Simultaneously, the agency would work with states and localities to establish air quality control regions in areas that needed air pollution control. Each region would then adopt air quality standards based on the criteria, and eventually develop strategies (such as establishing emissions standards for sources) to ensure that its air would come into and remain in compliance with the region's air quality standards.[28]

This scheme proved ineffective for want of federal and state action to implement it.[29] Thus, the CAA Amendments of 1970 drastically overhauled it. The philosophy behind the latter was that air pollution sources should be regulated according to the harm they did to health rather than on the basis of what control technology happened to have been developed for the category of source.[30] Thus, the 1970 Amendments established emissions standards for new cars that were based not on what was achievable, but on what was thought necessary to protect the public health.[31] In this way, the amendments were "technology-forcing"—they mandated that the auto industry do what was needed. The stationary source provisions came out of a similar approach: a desire to make industry invest in developing new ways to control air pollution control.

To accomplish this, the 1970 Amendments called for EPA to promulgate national ambient air quality standards (NAAQS) at levels that would protect public health and welfare, and required that states develop for EPA approval state implementation plans that would bring areas with excessive air pollution into attainment—that is, compliance—with these standards. For the health-based standards, the plans had to demonstrate that areas in violation would come into attainment—within three years.[32] If the sources did not do what was needed to meet the standards, they could be forced to clean up or be shut down—a point made clear in the Senate legislative history of the 1970 Amendments.[33] While there would be national emissions standards for hazardous air pollutants such as carcinogens, these standards would be based on what was needed to give ample protection to public health and welfare, not on what was feasible to do.[34]

22. Ethyl Corp. v. EPA, 541 F.2d 1, 24-26, 6 ELR 20267 (D.C. Cir. 1976) (Wright, J.) (en banc), *cert. denied*, 426 U.S. 941 (1976).
23. Air Quality Act of 1967, Pub. L. No. 90-148, 81 Stat. 489.
24. For descriptions of the development for the Air Quality Act, see Struggling, *supra* note 1, at 42-47; Charles O. Jones, Clean Air: The Policies and Politics of Pollution Control 76-87 (1975); John E. Bonine, *The Evolution of "Technology-Forcing" in the Clean Air Act*, Env't Rep. (BNA) Mono. No. 21, at 5-8 (1975).
25. *See* Jones, *supra* note 24, at 79-80.
26. *Id.* at 80-81.
27. Struggling, *supra* note 1, at 51. The authors characterize Leon Billings, who served on Senator Muskie's committee staff at the time and after, as having "conceded" this. I doubt Billings meant this as a concession of any kind, but rather just a statement of Senator Muskie's philosophy; *see Leon Billings Reflects on Writing the Clean Air Act*, YouTube (Dec. 26, 2010), https://www.youtube.com/watch?v=-oSA5marDzI (approximately the nine-minute mark).
28. *See* Jones, *supra* note 24, at 83-84; *see* Robert Martin & Lloyd Symington, *A Guide to the Air Quality Act of 1967*, 33 L. & Contemp. Probs. 239 (1968) *available at* http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=3197&context=lcp (a comprehensive description of the 1967 Act).
29. Struggling, *supra* note 1, at 47.
30. *See* Bonine, *supra* note 24, at 15-19. To quote Thomas Jorling, who was the minority counsel for the Senate subcommittee in 1970, the aim was "to slay the beast" of economic and technological feasibility. Telephone Conversation with Thomas Jorling, Aug. 12, 2016.
31. *See* 91 Cong. Rec. 32904-907 (1970) (colloquy between Senator Muskie and Sen. Robert Griffin (R-Mich.)). There, Senator Muskie states that "the deadline [for achieving the auto emission standards] is based not on economic and technological feasibility, but on considerations of public health.").
32. These provisions, significantly amended since 1970, are described in *Natural Resources Defense Council v. Train*, 545 F.2d 320, 7 ELR 20004 (2d Cir. 1976). For today's versions, see CAA 42 U.S.C. §§108-110, 42 U.S.C. §§7408-7410.
33. *See* S. Rep. No. 91-1196 (1970), at 2-3 ("[t]he Committee determined that existing sources of pollutants should meet the standard of the law or be closed down. . . .").
34. *See* Natural Resources Defense Council v. EPA, 824 F.2d 1146, 1176, 17 ELR 21032 (D.C. Cir. 1987) (Bork, J.) (en banc) (describing the hazardous

This is the paradigm of an environmental quality-based scheme of pollution control—one that calls on pollution sources to do what is necessary to make the environment safe regardless of whether technology had been developed.[35] Under this kind of scheme, there was no need for technology-based standards that would regulate sources by requiring them to do what was feasible.

But in one respect—new stationary sources—the Act adopted a technology-based approach. If regulation of sources were based exclusively on what was needed to achieve the air quality standards, then areas with clean air would have an advantage in attracting and keeping industry over those that did not. This, Nixon Administration witnesses testified, would undercut efforts to establish tough emission standards for new sources in dirty-air areas by shifting new sources to clean-air areas.[36] This "site-shifting" would as a practical matter destroy air pollution abatement efforts by making them politically unpalatable, particularly to labor unions in urban areas that wanted to prevent plants from abandoning the Northeast for the South as the textile industry had done.[37]

The Nixon Administration's witnesses endorsed the idea that the federal government establish "new source performance standards" based on what could be done by new and modified sources using the best demonstrated technology.[38] But there was no similar provision for existing sources because the rationale for the new source standards—the fear that clean air areas would have an untoward advantage in competing for new industry—did not apply to existing sources. Thus, existing sources were not "grandfathered"—that is, excluded from regulation—simply because they would have high compliance costs, but rather because the rationale for technology-based regulation of new sources did not apply to existing sources.

There was only one situation in which existing sources had to install the best technology. Suppose EPA set a new source standard for, say, pulp and paper mills that covered emissions of odiferous total reduced sulfur, a pollutant that is not regulated either by national air quality standards nor by hazardous air pollutant standards. In this instance, existing pulp and paper mills also would be subject to the new source performance standard for total reduced sulfur—but Congress stipulated that the states, in applying the standards, would be allowed to take into account the remaining useful life of the source.[39] This provision, §111(d), was a gap-filler for pollutants that did not fall under the air quality standards or hazardous air pollutants. Indeed, it was rarely used—one environmental lawyer has called it the 40-year-old virgin of the CAA[40]—until EPA decided to make it the basis for its recent Clean Power Plan to reduce utility emissions of greenhouse gases

Political Context of the CAA

Thus, the scheme was environmental quality-based in part because of the policy preferences of Senator Muskie. In addition, Senator Muskie was constrained by political reality. Consider, for instance, that Senator Muskie was not the chair of the full Committee on Public Works, but rather only of its Subcommittee on Air and Water Pollution; the full committee chair was Sen. Jennings Randolph (D) of West Virginia, who naturally was concerned with helping his impoverished state's coal industry.[41] It is hard to imagine Senator Randolph countenancing the control of existing power plants and thus jeopardizing the coal mining industry and miners represented by the United Mine Workers of America. Similarly, the U.S. House of Representatives committee with jurisdiction over the CAA was headed by Rep. Harley Staggers (D), also of West Virginia, another avid advocate of his state's economic interests.[42]

Then, too, Senator Muskie had to be concerned with attracting Republican support. He faced a dilemma. On the one hand, he had to outdo President Nixon in order to preserve his environmentalist credentials[43]—Ralph Nader, then at the height of his influence, had blasted Senator Muskie for not being aggressive enough[44]—and thus help him remain the leading candidate for the Democratic presidential nomination in 1972. On the other hand, Senator Muskie needed to develop a bill with enough bipartisan support that it could make its way through the Senate and House. So, he worked with Republican and Democratic members of his subcommittee behind closed doors—this was before the congressional reforms adopted after Watergate—to satisfy them.

Senator Muskie had a saying: "If I could control the positions of the extremes, then I could control where the middle is—and always win."[45] Even the technology-forcing mobile source provisions came from a desire to control the middle. The California State Senate, Sen. Gaylord Nelson (D.-Wis.), and several congressmen had advocated that the internal combustion engine be outlawed in five years, and

air pollutant provisions as they were passed in 1970); the present scheme may be found at CAA §112, 42 U.S.C. §7412).

35. *See* Bonine, *supra* note 24, at 16.
36. *See* Committee on Public Works, 2 Legislative History of the Clean Air Act Amendments of 1970 973, 1366 (1974). Robert Finch's testimony was before Senator Muskie's subcommittee. His under-secretary, John Veneman, testified to the same effect before the U.S. House of Representative's Committee on Interstate and Foreign Commerce the previous day, *available at* https://babel.hathitrust.org/cgi/pt?id=mdp.39015077941626;view=1up;seq=7.
37. Struggling, *supra* note 1, at 52.
38. *See supra* note 36.
39. *See* CAA §111(d), 42 U.S.C. §7411(d); *see also* Oren, *supra* note 16.
40. Coral Davenport, *Brothers Battle Climate Change on Two Fronts*, N.Y. Times (May 10, 2014), *at* http://www.nytimes.com/2014/05/11/us/brothers-work-different-angles-in-taking-on-climate-change.html?_r=0 (quoting David Doniger of the Natural Resources Defense Council).
41. *See* David Stout, *Jennings Randolph of West Virginia Dies at 96*, N.Y. Times (May 9, 1998), *at* http://www.nytimes.com/1998/05/09/us/senator-jennings-randolph-of-west-virginia-dies-at-96.html.
42. *See* Noam S. Cohen, *Rep. Harley O. Staggers Sr., 84, Democrat Who Aided Railroads*, N.Y. Times (Aug. 21, 1991), *at* www.nytimes.com/1991/08/21/us/rep-harley-o-staggers-sr-84-democrat-who-aided-railroads.html.
43. *See* Jones, *supra* note 24, at 179.
44. Struggling, *supra* note 1, at 50; Jones, *supra* note 24, at 191-92; John C. Esposito, Vanishing Air: The Ralph Nader Study Group Report on Air Pollution (1970).
45. *See* Bernard Asbell, The Senate Nobody Knows 177 (1978).

so technology-forcing the auto industry amounted to an intermediate strategy.[46] Even so, industry expressed shock at the stringency of the subcommittee bill, as witnessed by their statements when it was released.[47]

Revesz and Lienke would doubtless respond by pointing out that the Federal Water Pollution Control Act Amendments of 1972[48] (better known as the Clean Water Act (CWA)) included national emission standards for existing sources, thus indicating that this approach was politically feasible.[49] But the context in which the CWA was enacted was far different from that of the CAA. There already was a technology-based permit program, administered by the U.S. Army Corps of Engineers and EPA, for existing dischargers of water pollution.[50] This program had been established in response to two U.S. Supreme Court decisions holding that the Refuse Act of 1897 barred discharges into the waters of the United States.[51] It would have been quite disruptive to change this program.

Moreover, Senator Muskie's environmental quality approach could not work for water because it would not be possible to have uniform standards for water, which can be salty, brackish, or fresh; air, by contrast, is alike everywhere. In addition, the environmental quality-based approach had been tried and failed with water pollution,[52] in part because of the difficulty of relating discharges by sources to water quality.[53] Thus, Senator Muskie could retreat from the environmental quality-based CAA approach without hurting health or the environment. While the CWA does contain mandates for states to set water quality standards and to regulate sources to meet those standards, this program has been, to put it mildly, slow to take hold.[54]

So, the fact that the CWA contained standards for existing sources says little about whether such standards could have been included in the CAA amendments. Rather, as discussed earlier, there was a great difference between the 1970 CAA Amendments and environmental perfection. Moreover, in the context of 1970, putting technology-based limits on existing power plants did not seem essential. Already some plant operators (such as Consolidated Edison in New York)[55] had switched from coal to oil, partly under pressure from air pollution enforcement authorities, but primarily because burning oil cost less.[56] Coal had been losing other markets steadily since World War II.[57]

The national ambient air quality standard/state implementation system could be expected to result in more such switches as part of state strategies to attain the air quality standards. In fact, Ohio,[58] Indiana,[59] and Missouri,[60] although full of coal-fired capacity and coal mines, had written ambitious plans for power plants that required some existing power plants to reduce their emissions significantly to levels that at least one utility thought were impossible.[61] Moreover, some companies were contemplating replacing coal-fired plants with nuclear plants, with one utility even contemplating putting a nuclear plant offshore.[62] As late as 1979, EPA believed that nuclear capacity would more than double between 1985 and 1995.[63]

History of CAA Implementation

All of these assumptions and plans fell apart in the 1970s as the CAA Amendments of 1970 went into effect. The Arab oil embargo of 1973 led to Congress' enactment of the Energy Supply and Environmental Coordination Act,[64] which attempted to switch oil-fired electricity capacity to burning coal.[65] The crisis also led to many states abandoning their ambitious goals for emission reduction. Instead, states and power plants sought to substitute intermittent

46. *See* Jones, *supra* note 24, at 188-89, 203.
47. *Id*. at 196-98.
48. Pub. L. No. 92-500, 86 Stat. 894 (1972).
49. *See* Struggling, *supra* note 1, at 40-41.
50. John Quarles, Cleaning Up America: An Insider's View of the Environmental Protection Agency 97-117 (1976).
51. *See* United States v. Republic Steel Corp., 362 U.S. 482 (1960); United States v. Standard Oil Co., 384 U.S. 224 (1966).
52. *See* Oliver A. Houck, The Clean Water Act TMDL Program: Law, Policy and Implementation 12-14 (ELI Press 2d ed. 2002).
53. *See* Committee on Public Works, United States Senate, 92nd Cong., Federal Water Pollution Control Act Amendments of 1971, at 8 (1971). Modeling water pollution still remains a challenge. *See* Amena H. Saiyid, *Fix Water Quality Model for Illinois River, Republicans Urge EPA*, 47 Env't Rep. (BNA) Current Dev. 2544 (2016).
54. Houck, *supra* note 52, at 49-75.
55. *See* Ari Goldman, *Coal Comeback Looms as U.S. Tells 7 New York-Area Plants to Convert*, N.Y. Times (May 12, 1977), *at* http://www.nytimes.com/1977/05/12/archives/coal-comeback-looms-as-us-tells-7-new-yorkarea-plants-to-convert.html?_r=1.
56. *See* Irwin Molotsky, *Having Gone From Oil to Coal, Utilities Leery of Going Back* (Aug. 23, 1979) N.Y. Times; 2 A Legislative History of the Energy Supply and Environmental Coordination Act of 1974 2492 (statement of Russell Train, U.S. EPA Administrator,"I think there has been a tremendous economic incentive for switching that goes well beyond environmental factors.").
57. E-mail from A. Denny Ellerman, to the Craig N. Oren (July 22, 2016): coal had lost one market after another and by the late 1960s with nuclear power, infamously then believed to be too cheap to meter, and super-low oil prices, coal's last redoubt in the electric utility industry seemed headed for the same fate as in all the other markets. To the extent that coal was seen as an environmental problem, this was one that would solve itself in due time.
(on file with author).
58. *See* Melnick, *supra* note 10, at 228.
59. *See* Air Pollution Control District v. EPA, 739 F.2d 1071, 1076, 14 ELR 20573 (6th Cir. 1984) (original emission limit for plants near the Indiana border with Kentucky were 1.2 pounds of sulfur dioxide per million British thermal units, a level equivalent to what EPA was then requiring for new sources); Struggling, *supra* note 1, at 91.
60. *See* Union Electric v. EPA, 427 U.S. 246, 252, 6 ELR 20570 (1976).
61. *See id*. at 269 (concurring opinion of Powell, J.).
62. *See* Ted Sherman, *Floating Nuclear Plants? The Worst Idea N.J. Utility Ever Had?*, nj.com (Aug 15, 2016), *at* http://www.nj.com/inside-jersey/index.ssf/2016/08/offshore_nuclear_power_plants_nj_utility_once_considered_the_idea.html; https://en.wikipedia.org/wiki/Offshore_Power_Systems (recording efforts to locate such plants, e.g., off the coast of New Jersey); E-mail from Benjamin Hobbs, to Craig Oren, July 24, 2016.
63. *See* Sierra Club v. Costle, 657 F.2d 298, 413, 11 ELR 20455 (D.C. Cir. 1981) (reprinting table of "key assumptions" made by EPA in promulgating new source performance standard in 1979 for fossil-fuel-fired power plants). In the early 1980s, I once mentioned to an EPA analyst who had worked extensively on the rulemaking that what he was telling me was contrary to the assumptions about the future made in the rulemaking. "Don't you know?," he said. "Everything we projected turned out to be wrong!" Again, uncertainty is endemic to environmental law.
64. Energy Supply and Environmental Coordination Act of 1974, Pub. L. No. 93-319 (1974).
65. Arnold W. Reitze Jr., Air Pollution Control Law: Compliance and Enforcement 17 (ELI Press 2001).

control strategies like tall stacks for emissions control, and realized that even without such strategies, it was often possible to demonstrate that the air quality standards could be met without controlling coal-fired power plants.[66] And the shift toward nuclear energy abruptly ended amid the controversies of the 1970s, especially the Three Mile Island accident of 1979. Thus, pre-1970 coal-fired plants stayed in operation, and so the control of emissions from these plants became more important than the drafters of the 1970 Amendments had reason to assume.

Moreover, the nature of the threat from coal-fired power plants was not sufficiently understood in 1970. The idea that sulfur dioxide emissions in the Midwest could be transported to the Northeast and cause damage was quite controversial into the 1980s.[67] That is one reason—aside from the Ronald Reagan Administration's obstinance—why it took until 1990 to pass the acid rain program.[68] In addition, it took time to corroborate early reports of the dangers of sulfates, the fine particles into which sulfur dioxide emissions from power plants are transformed, and to overcome industry opposition to regulation. EPA's initial attempts to learn of the health damage caused by sulfates, known as the Community Health Environmental Surveillance Studies (CHESS), were denounced by industry as methodologically flawed, a contention that attracted much media and congressional attention.[69] It was not until the late 1990s that the Agency concluded that it had the scientific basis to regulate sulfates and other fine particles.[70]

As for nitrogen dioxide, it was then known to contribute to dangerous ozone in the air[71] (although not to the extent today), but was regarded as uncontrollable from stationary sources,[72] and selective catalytic removal, which controls nitrogen oxide emissions, had not yet been developed.[73] Only later was it established that ozone and its precursors could travel far downwind, thus causing ozone to form in areas far from the sources.[74] In response, EPA in the 1990s began implementing programs to control interstate transport of nitrogen oxides.

Finally, control technology was not nearly as developed as it is today. Revesz and Lienke argue that the "grandfathering" of existing plants led utilities to prolong the existing life of the plants beyond the 30 years originally expected.[75] Their argument is almost certainly right. But, as they say, the chief incentive for utilities to postpone retirement was the requirement for scrubbing, which adds a great deal to capital and maintenance costs. This requirement could not have been foreseen in 1970, when scrubbers were still opposed by industry as infeasible,[76] and when switching fuel was the only control technique available. Senator Muskie could hardly have anticipated that in 1977 environmentalists and high-sulfur coal interests would persuade Congress to mandate that all new power plants include control technology, thus leading EPA to require scrubbers on all new power plants.[77] And Senator Muskie bears little responsibility for the 1977 mandate, which originated in the House as a way to placate high-sulfur coal interests that feared that new plants would otherwise use low-sulfur coal[78]

Thus, the case for regulating existing power plants has become much more powerful since 1970. It seems unfair to expect environmental advocates like Senator Muskie to have anticipated this in 1970. Thus, Revesz and Lienke seem to overlook the scientific and policy context in which the CAA Amendments of 1970 were born.

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66. *See, e.g.*, Ohio v. EPA, 784 F.2d 224, 227, 16 ELR 20447 (6th Cir. 1986) (reviewing the history of the Avon and Eastlake power plants in the Cleveland area).
67. Indeed, Revesz and Lienke agree that acid rain was "not on the radar screen" in 1970, and that controversy about acid rain continued at least through 1985. Struggling, *supra* note 1, at 90-104. For a sampling of the controversy about causes and effects, see *Acid Precipitation: Effects and Solutions to Control Acid Precipitation (Parts I and II), Hearings Before the Subcommittee on Health and the Environment of the Committee on Energy and Commerce of the House of Representatives*, 97th Cong. 97-99, 97-100 (1981), *available at* https://babel.hathitrust.org/cgi/pt?id=mdp.39015004961036. At the latter hearing, one representative of the Midwest alleged that the "acid rain political controversy" was linked to the national energy objectives of Canada. *See Part II*, at 155-76 (testimony of James M. Friedman, counsel, Ohio Coalition on Energy-Environmental Balance). As one can see, theories that environmental issues are mere stalking horses for economic domination by other nations did not start with this year's Presidential campaign.
68. Clean Air Act Amendment of 1990, Pub. L. No. 101-549, 104 Stat. 2409 Title IV (establishing acid rain control provisions).
69. *See* William B. Rood, *EPA Study: The Findings Got Distorted; Research on Sulfur's Effect on Health Stirs Power Company Furore* [sic], L.A. Times, Feb. 29, 1976. The story led to a very critical House hearing. *See The Conduct of the EPA's "Community Health Environmental Surveillance System"(Chess) Studies: Joint Hearings Before the Subcommittee on the Environment and Atmosphere, Committee on Science and Technology and the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce*, 94th Cong. 94-109. The author recalls that he was present in 1979 at a public review of the scientific evidence on sulfates. The CHESS studies, although done years earlier, were heavily attacked. *See Preliminary Criteria Documents Draw Fire From Industry Representatives*, 13 Env't Rep. (BNA) Current Dev. 1545 (1979).
70. *See* National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38652 (1997). Even then, the standards were quite controversial. *See* Craig N. Oren, *The Ghost of Delegation Revived . . . and Exorcised*, *in* Administrative Law Stories 6, 18-26 (Peter Strauss ed., 2006). The debate about the health effects of fine particulates continues. *See* National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086, 3112-21 (Jan. 15, 2013) (EPA's summaries and responses to comments). Some believe that sulfates are not the harmful constituent of particulate matter, which consists of a broad array of chemical species. *See* Thomas Grahame & Richard Schlesinger, *Is Ambient $PM_{2.5}$ Sulfate Harmful?*, 120 Envtl. Health Persp. A 454 (2012), *available at* http://ehp.niehs.nih.gov/wp-content/uploads/2012/11/ehp.1205873.pdf.
71. *See* James E. Krier & Edmund Ursin, Pollution and Policy 79-83 (1977) (recounting research by Arie Jan Haagen-Smit in the 1950s).
72. *See* Texas v. EPA, 499 F.2d 289, 294 n.1, 4 ELR 20744 (5th Cir. 1974) (the opinion was written by Judge Griffin Bell, who later became Attorney General of the United States under President Jimmy Carter.)
73. E-mail from Richard E. Ayres, former attorney at the Natural Resources Defense Council, to Craig N. Oren (July 8, 2016) (on file with author).
74. *See* NESCAUM, The Long-Range Transport of Ozone and Its Precursors to the Eastern United States 1-3 (1997).
75. Struggling, *supra* note 1, at 33.
76. *See* Ayres, *supra* note 73.
77. *See* Clean Air Act Amendments of 1977, Pub. L. No. 95-95, §110 (revising CAA §111 to require that the new source performance standards compel a "percentage reduction" from new plants).
78. *See* Bruce A. Ackerman & William T. Hassler, Clean Coal/Dirty Air: Or How the Clean Air Act Became a Multibillion-Dollar Bail-Out for High-Sulfur Coal Producers and What Should Be Done About It 29-33 (1981). Note that on the one hand, Revesz and Lienke say that scrubbing was an early regulation, thus implying that Senator Muskie should have anticipated it, Struggling, *supra* note 1, at 3, while later they agree that scrubbing was not required until 1978, eight years after what Revesz and Lienke regard as the key timetable for decision. *Id*. at 32.

Revesz and Lienke in Chapters 4-6 then pass to the history of the implementation of the CAA. They show how the continuation of pre-1970 power plants consistently hampered EPA's efforts to regulate power plant emissions. For instance, EPA found itself compelled to adopt relaxed definitions of what constituted a modification at a power plant.[79] But this was not caused by any defect in the statute—indeed, as Revesz and Lienke point out, the most egregious of the EPA definitions was struck down by the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit as illegal[80]—but rather by the utility industry's political clout. Revesz and Lienke, in fact, recite the political contributions and other pressures exerted by power plant representatives.[81]

Indeed, the political influence of existing power plants would have affected the implementation of national emission standards for such plants even assuming that Congress had mandated them in 1970. To see this, we need only glance at the treatment of existing power plants under the CWA. Power plants need water to cool the machinery that generates electricity. Thus, power plants are often located near bodies of water from which they take in water. The water passes though intake screens, and many marine organisms are killed on the screens. Marine organisms that pass the screens are often sucked into the cooling water system and die.[82]

Congress responded in 1972 by enacting CWA §316(b),[83] which requires EPA to set standards for cooling water intake structures that "reflect the best technology available for minimizing adverse environmental impact." EPA did not actually set these standards until 2004 during the George W. Bush Administration. Until then, the states set the standards case-by-case,[84] which (given the pressures the states are under to accommodate local industry) did not guarantee environmental protection.[85] When EPA finally made the standards, it used cost-benefit analysis,[86] even though Supreme Court precedent suggested that EPA might have been on firm legal ground had it not done so.[87]

This illustrates a point that Revesz and Lienke, surprisingly, miss in this context: that, due to the push and pull of contending forces on an agency, the mere presence of authorizing or mandatory language in a statute does not necessarily translate into effective administrative implementation. The fact that Congress mandates standards for existing power plants does not guarantee that the standards will actually be set according to Congress' desires at the moment of enactment. Thus, I doubt whether CAA standards for existing power plants would have done as much good as Revesz and Lienke assume.

Conclusion

In sum, Revesz and Lienke's argument that Congress in 1970 should have mandated national air pollution emission standards for existing power plants is correct only in retrospect; the argument ignores the difficulties that would be encountered in actually bringing such standards to pass. It must be remembered that the 1970 Amendments were a breakthrough in air pollution control: Congress had not previously authorized or mandated technology-forcing, or NAAQS, or federal government supervision of states' measures to reduce air pollution.

Senator Muskie was thus not at fault in not pushing for national emissions standards for existing plants in 1970. At most, we can say that he did not anticipate how a differentiation between old and new could result in environmental harm. But given all of the advances made by the 1970 Amendments, the state of new air pollution control at that time, the lack of knowledge about effects, and the political situation, Senator Muskie was more than reasonable in not anticipating the issue then.

79. Struggling, *supra* note 1, at 55-81. The authors also cite efforts to cut the emissions that cause global warming, arguing that the "grandfathering" of pre-1970 power plants has hampered these efforts. *Id*. at 133-37.
80. *Id*. at 77-78.
81. *Id*. at 74-75.
82. *See* Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208, 213, 39 ELR 20067 (2009).
83. 33 U.S.C. §1326 (2005).
84. *Entergy*, 556 U.S. at 213.
85. *See* Kirsten H. Engel, *State Environmental Standard-Setting: Is There a "Race" and Is It "To the Bottom"?*, 48 Hastings L.J. 271 (1997).
86. *Entergy*, 556 U.S. at 217.
87. *See* American Textile Manufacturers Ass'n v. Donovan, 452 U.S. 490, 11 ELR 20736 (1981) (holding that an agency need not consider costs and benefits in setting technology-based standards).